

- (a) providing a fluidized bed reactor, said reactor comprising:
- (1) a catalyst bed for reacting ammonia and hydrocarbons therein;
  - (2) a dilute phase of the catalyst bed disposed above the catalyst bed;
  - (3) a set of internals disposed at least partially within the dilute phase of the catalyst bed; and
- (b) removing the unreacted ammonia from the effluent of the catalyst bed by passing the effluent through the set of internals, wherein the ammonia and hydrocarbons present in the effluent contact the dilute phase of the catalyst bed and react therein.

### REMARKS

Claims 5-9 are in the case. Claim 5 and 9 have been amended.

Support for the amendments of claims 5 and 9 can be found throughout the specification, for example, page 1, lines 6-9 and page 4, lines 18-23 of the description, as originally filed. No new matter has been added.

#### **I. Claim Rejections Under 35 U.S.C. § 112**

Claim 8 was rejected under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants

regard as the invention. Specifically, the Office Action states that the limitation "the hydrocarbons" in lines 1-2 has insufficient antecedent basis.

Applicants have amended claim 5 by changing the wording "a hydrocarbon ammoxidation reaction" to "ammoxidation of hydrocarbons", as shown in Appendix A. This amendment renders the objection of claim 8 moot. The amendment of claim 9 is just for consistency of recitation of the same term.

In view of the above, Applicants respectfully request the withdrawal of the rejection of claim 8 under 35 U.S.C. § 112, second paragraph.

## II. Claim Rejections - Under 35 U.S.C. § 102

Claims 5-6 and 8-9 were rejected under 35 U.S.C. § 102(b) as being anticipated by US 4, 470,931(Callahan *et al.*). The applicants respectfully traverse.

Callahan *et al.* discloses a process for conducting a combination of fixed and fluidized bed (See the abstract; col.1, lines 60-63; and claim 1), i.e., a process using an apparatus generally known as B-T type reactor. On the contrary, the present invention uses a single fluidized bed. In the present invention, a set of internals is introduced into the space above the catalyst bed layer (on the top of the catalyst layer) but not placed within the catalyst layer. In addition, The function of the internals disposed in the dilute phase above the catalyst bed in the present invention is to remove residual unreacted ammonia in the reaction gas through the secondary reaction, which is not identical with that of the grids or screens of supporting the fixed bed catalyst or that of the fixed bed itself. Therefore, claims 5-6 and 8-9 are not anticipated by Callahan *et al.*

Arg 1

Arg 2

### III. Claim Rejections - Under 35 U.S.C. § 103(a)

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Callahan *et al.* The applicants respectfully traverse.

As mentioned above, Callahan *et al.* discloses a process for conducting a combination of fixed and fluidized bed, i.e., a process by using an apparatus generally known as B-T type reactor. In fact, the process has been published in articles in the 1960's. When using fluidized bed reactor, there exists the problem of gas stream back-mixing though the heat transfer performance of fluidized bed reactor is good. But, the fixed bed reactor has its strong point compared to the fluidized bed reactor. Therefore, this combination should be the most reasonable technical solution in theory. However, the technical solution has not been applied in practice for a long time, because it will creates new problem of creating high resistance when the gas stream passes through the catalyst in the fixed bed.

In order to solve the problem, the present invention employs a single fluidized bed than concurrently installing fixed bed catalyst and fluidized bed. Moreover, a set of the internals is introduced into the space above the catalyst bed layer to raise contact efficiency between the reaction gas and the catalyst. Moreover, the internals is not placed within the catalyst layer but on the top of the catalyst layer, and its function is to remove residual unreacted ammonia in the reaction gas through the secondary reaction. If the internals are added within the catalyst layer, only the first reaction can be accelerated. Since the oxidation rate

of ammonia exceeds that of propylene, this will result in that the ratio of ammonia to propylene in the catalyst layer is too low. Thus, the main reaction product will be acrylic aldehyde produced by oxidation but not acrylonitrile produced by ammoxidation. This is exactly where the difference between the present invention and Callahan *et al.* lies.

Arg 2  
Unlike the office action said, the function of installing the fixed bed catalyst in Callahan *et al.* is not identical with that of the internals disposed in the dilute phase above the catalyst bed in the present invention. The incorporation of the fixed bed catalyst is to accelerate the first reaction rather than the second reaction, but the internals disposed in the dilute phase above the catalyst bed in the present invention is to promote the second reaction of the unreacted ammonia. There is no clear indication in Callahan *et al.* that the addition of the baffles can take effect of accelerating the first reaction. The addition of the baffles is certainly not to accelerate the first reaction. Otherwise, it would be unnecessary to introduce again the fixed bed catalyst.

Though there is a mention that "the unreacted ammonia in the reaction gas can be removed by the process" in Example 7 of Callahan *et al.*, no data showing the effect were given. Moreover, all examples in Examples 1-6 of Callahan *et al.* illustrate the oxidation of propylene, which has nothing to do with ammonia, but not the ammoxidation.

The object of Callahan *et al.* is totally different from that of the present invention, the former being to increase the conversion in the first reaction. So, what is claimed in the claims of Callahan *et al.* is not a process for removing the unreacted ammonia.

Therefore, Callahan *et al.* would not suggest one of ordinary skill in the art to arrive at the present invention. Therefore, not only claim 7 but also claims 5-6 and 8-9 of the present invention are patentable over Callahan *et al.*

Respectfully submitted,

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Enclosures (Appendixes A & B)